Docket No.: SON-2010
(PATENT)

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Patent Application of:
Hisao Hayashi et al.

Application No.: 09/772,986 | Confirmation No.: 2637

Filed: January 31, 2001 | Art Unit: 2811

For: THIN FILM SEMICONDUCTOR DEVICE AND MANUFACTURING METHOD THEREOF | Examiner: T. F. Tran

APPELLANT'S BRIEF

MS Appeal Brief - Patents
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Dear Sir:

INTRODUCTORY COMMENTS

This is an Appeal Brief under 37 C.F.R. §41.37 appealing the final decision of the Examiner dated November 28, 2007. Each of the topics required by 37 C.F.R. §41.37 is presented herewith and is labeled appropriately.

This brief is in furtherance of the Final Office Action on November 28, 2007.

Accordingly, the filing of the Appellant's Brief is timely. 37 C.F.R. §1.136.

I. REAL PARTY IN INTEREST

Sony Corporation of Tokyo, Japan ("Sony") is the real party in interest of the present application. An assignment of all rights in the present application to Sony was executed by the inventor and recorded by the U.S. Patent and Trademark Office at **Reel 011519, Frame 0913**.

II. RELATED APPEALS AND INTERFERENCES

The Decision on Appeal dated June 28, 2007 reversed the rejection under 35 U.S.C. §102 of prior claims 1-8, 13, and 15 while sustaining the rejection under 35 U.S.C. §103 of prior claims 14 and 16. Page 8 of the Decision on Appeal indicates a rejection under 37 C.F.R. §41.50(b).

There are no other appeals or interferences which will directly affect or be directly affected by or have a bearing on the Board's decision in this appeal.

III. STATUS OF CLAIMS

Within the Final Office Action of November 28, 2007:

Page 2 of the Final Office Action includes a rejection of claims 17-27 and 36 under 35 U.S.C. §103 as allegedly being unpatentable over Japanese Publication No. 10-209467 to Hisao et al (Hisao).

Page 4 of the Final Office Action includes a rejection of claims 28-32 under 35 U.S.C. §103 as allegedly being unpatentable over Japanese Publication No. 10-209467 to Hisao et al (Hisao) in view of U.S. Patent No. 5,912,506 to Colgan et al. (Colgan).

Page 5 of the Final Office Action includes a rejection of claims 31-35 under 35 U.S.C. §103 as allegedly being unpatentable over Japanese Publication No. 10-209467 to Hisao et al (Hisao) in view of U.S. Patent No. 6,235,561 to Seiki et al. (Seiki).

Thus, the status of the claims is as follows:

Claims 1-16: (Canceled);

Claim 17-36: (Rejected).

No claims are indicated within the Final Office Action to contain allowable subject matter.

Accordingly, Appellant hereby appeals the final rejection of claims 17-36 which are presented in the Claims Appendix.

IV. STATUS OF AMENDMENTS

Provided is a statement of the status of any amendment filed subsequent to final rejection.

Subsequent to the final rejection of November 28, 2007, an Response to Final Action was filed on January 25, 2008.

The Advisory Action of February 13, 2008 maintains the final rejection of claims 17-36.

V. SUMMARY OF CLAIMED SUBJECT MATTER

The following description is provided for illustrative purposes and is not intended to limit the scope of the invention.

Claims 17-36 stand or fall together - Claims 18-36 are dependent upon claim 17. Claim 17 is drawn to a thin film semiconductor device comprising:

a gate electrode (5) in contact with an insulating substrate (1) (Specification page 9, lines 3-8);

a gate insulating film (4) in contact with a gate electrode (5), said gate electrode (5) being between said insulating substrate (4) and said gate insulating film (4) (Specification page 9, lines 3-8),

wherein a thickness of said gate insulating film (4) is greater than a thickness of said gate electrode (5) (Specification page 9, lines 28-30).

VI. GROUNDS OF REJECTION TO BE REVIEWED ON APPEAL

The issues presented for consideration in this appeal are as follows:

Whether the Examiner erred in rejecting claims 17-27 and 36 under 35 U.S.C. §103 as allegedly being unpatentable over Japanese Publication No. 10-209467 to Hisao et al (Hisao).

Whether the Examiner erred in rejecting claims 28-32 under 35 U.S.C. §103 as allegedly being unpatentable over Japanese Publication No. 10-209467 to Hisao et al (Hisao) in view of U.S. Patent No. 5,912,506 to Colgan et al. (Colgan).

Whether the Examiner erred in rejecting claims 31-35 under 35 U.S.C. §103 as allegedly being unpatentable over Japanese Publication No. 10-209467 to Hisao et al (Hisao) in view of U.S. Patent No. 6,235,561 to Seiki et al. (Seiki).

These issues will be discussed hereinbelow.

VII. ARGUMENT

In The Final Office Action of November 28, 2007, the Examiner erred in rejecting claims 17-27 and 36 under 35 U.S.C. §103 as allegedly being unpatentable over Japanese Publication No. 10-209467 to Hisao et al (Hisao).

In The Final Office Action of November 28, 2007, the Examiner erred in rejecting claims 28-32 under 35 U.S.C. §103 as allegedly being unpatentable over Japanese Publication No. 10-209467 to Hisao et al (Hisao) in view of U.S. Patent No. 5,912,506 to Colgan et al. (Colgan).

In The Final Office Action of November 28, 2007, the Examiner erred in rejecting claims 31-35 under 35 U.S.C. §103 as allegedly being unpatentable over Japanese Publication No. 10-209467 to Hisao et al (Hisao) in view of U.S. Patent No. 6,235,561 to Seiki et al. (Seiki).

For at least the following reasons, Appellant submits that this rejection is both technically and legally unsound and should therefore be reversed.

Claims 17-36 stand or fall together - Claims 18-36 are dependent upon claim 17. Claim 17 is drawn to a thin film semiconductor device comprising:

a gate electrode in contact with an insulating substrate;

a gate insulating film in contact with a gate electrode, said gate electrode being between said insulating substrate and said gate insulating film,

wherein a thickness of said gate insulating film is greater than a thickness of said gate electrode.

Within claim 17, *a thickness of said gate insulating film is greater than a thickness of said gate electrode*.

The specification at page 10, lines 7-9, provide that *therefore, the thickness Ti of the gate insulating film 4 is made to become greater than the thickness Tm of the gate electrodes 5*.

Hisao - Hisao arguably teaches an insulator layer 4 having a thickness of 100-200 nm (figure 2(C), paragraph [0016]) and arguably teaches a thin film semiconductor device having a gate electrode 5 having an upper layer 5a of 50-200 nm and a lower layer 5b of 50-200 nm (Figure 1, paragraph [0012]).

The Final Office Action asserts that *the upper layer 5a and the lower layer 5b together provides a combined gate thickness of about 100-500 nm* (Final Office Action at page 2).

There is no concession as to the veracity of the assertion found within the Final Office Action that *the upper layer 5a and the lower layer 5b together provides a combined gate thickness of about 100-500 nm*. But even if this assertion is true, this assertion ***fails*** to show a teaching within Hisao of *a thickness of insulator layer 4 being* ***GREATER THAN*** *a thickness of the gate electrode 5*.

Additionally, the Final Office Action additionally asserts that Hisao discloses that *the gate insulating film 4 has a thickness in the range of 100-200 nm which allows for a lower limit range value of 100 nm* (Final Office Action at page 2).

There is no concession as to the veracity of the assertion found within the Final Office Action that *the gate insulating film 4 has a thickness in the range of 100-200 nm which allows for a lower limit range value of 100 nm.* But even if this assertion is true, this assertion ***fails*** to show a teaching within Hisao of *a thickness of insulator layer 4 being* ***GREATER THAN*** *a thickness of the gate electrode 5.*

In this regard, the Final Office Action ***fails*** to identify a teaching within Hisao that is sufficient to show a thickness of insulator layer 4 relative to a thickness of the gate electrode 5.

Instead, the Final Office Action appears to merely argue, *without providing any objective evidence*, that Hisao teaches a thin film semiconductor device *wherein a thickness of the gate insulating film 4 (100 nm) is greater than a thickness of the gate electrode 5a,5b (slightly less than 100 nm)* (Final Office Action at page 2).

In response, it is well established under U.S. patent practice and procedures that *drawings do not* define the precise proportions of the elements and *may not* be relied on to show particular sizes *if the specification is completely* ***silent*** on the issue. *Hockerson-Halberstadt Inc. v. Avia Group International Inc.*, 222 F.3d 951, 956, 55 USPQ2d 1487, 1491 (Fed. Cir. 2000). See M.P.E.P. §2125 (proportions of features in a drawing are not evidence of actual proportions when drawings are not drawn to scale).

Moreover, arguments based on the measurement of a drawing *are of little value absent any written description* in the specification of the quantitative values allegedly shown within the drawings. *In re Wright*, 569 F.2d 1124, 1127, 193 USPQ 332, 335 (CCPA 1977).

In this regard, Hisao arguably teaches an insulator layer 4 having a thickness of 100-200 nm (figure 2(C), paragraph [0016]) and arguably teaches a thin film semiconductor device having a gate electrode 5 having an upper layer 5a of 50-200 nm and a lower layer 5b of 50-200 nm (figure 1, paragraph [0012]).

Here, Hisao arguably teaches overlapping ranges of thicknesses between the insulator layer 4, the upper layer 5a, and the lower layer 5b as shown hereinabove and noted in the Decision on Appeal of June 28, 2007 at pages 8-9.

Yet, the Final Office Action ***fails*** to identify any written description in the specification of Hisao for the teaching that a thickness of said gate insulating film 4 ***is greater*** than a thickness of the gate electrode 5.

A patentable invention, within the ambit of 35 U.S.C. §103 may result even if the inventor has, in effect, merely combined features, old in the art, for their known purpose, without producing anything beyond the results *inherent* in their use. *In re Sponnoble*, 160 USPQ 237, 243 (CCPA 1969).

In addition, such a retrospective view of inherency ***is not a substitute*** *for some teaching or suggestion supporting an obviousness rejection. In re Rijckaert,* 28 USPQ2d 1955, 1957 (Fed. Cir. 1993).

Moreover, an invention is "obvious-to-try" where the prior art gives either *no indication* of which parameters are critical or *no direction* as to which of many possible choices is likely to be successful. *Merck & Co. Inc. v. Biocraft Laboratories Inc.*, 10 USPQ2d 1843, 1845 (Fed. Cir. 1989).

Here, Hisao *does not contain a sufficient teaching* of how to obtain the desired result, or that the claimed result would be obtained if certain directions were pursued.

This failure of some teaching within Hisao is especially apparent when the skilled artisan could reasonably conclude from the ranges presented within the Final Office Action that the alleged gate insulating film 4 could also be of a thickness that is *less than* that of the gate electrode 5.

"Obvious-to-try" is not the standard under §103. *In re O'Farrell*, 7 USPQ2d 1673, 1680 (Fed. Cir. 1988).

The Advisory Action of February 13, 2008 provides on page 2 that:

> A person of ordinary skill has good reason to pursue the known options within his or her technical grasp. If this leads to the anticipated success, it is likely that product was not of innovation but of ordinary skill and common sense. In that instance the a combination was obvious to try might show that it was obvious under 103. *KSR International Co. v. Teleflex Inc.*, 550 U.S., 82 USPQ2d 1385, 1397 (2007).

In response, *common sense* teaches, however, that familiar items may have obvious uses beyond their primary purposes, and in many cases a person of ordinary skill will be able to fit the teachings of multiple patents together like pieces of a puzzle. *KSR International Co. v. Teleflex Inc.*, 82 USPQ2d 1385, 1397 (U.S. 2007).

Nevertheless, broad conclusory statements, standing alone, are not evidence. *In re Dembiczak*, 50 USPQ2d 1614, 1617 (Fed. Cir. 1999). Instead, the teachings, suggestions or incentives supporting the obviousness-type rejection must be clear and particular.

Likewise, assertions of technical facts in areas of esoteric technology ***must always be supported*** *by citation to some reference work* recognized as standard in the pertinent art. *In re Pardo and Landau*, 214 USPQ 673, 677 (CCPA 1982). The support must have existed at the time the claimed invention was made. *In re Merck & Co., Inc.*, 231 USPQ 375, 379 (Fed. Cir. 1986).

Yet, in the *absence of any objective evidence*, the Final Office Action ***failed to explain*** the "common knowledge and common sense" on which it relied. *DyStar Textilfarben GmbH & Co. Deutschland KG v. C.H. Patrick Co.*, 80 USPQ2d 1641, 1649 (Fed. Cir. 2006). Specifically, *conclusory do not fulfill the agency's obligation* to explain all material facts relating to a motivation to combine. *DyStar* at 1650. As a result, this assessment of basic knowledge and common sense ***was not based on any evidence in the record***. *Id.*

- ***Thus, the Final Office Action fails to show a teaching within Hisao of a thin film semiconductor device wherein a thickness of said gate insulating film is greater than a thickness of said gate electrode.***

The Final Office Action asserts that *it has been held that where the general conditions of a claim are disclosed in the prior art, discovering the optimum or workable ranges involves only routine skill in the art* (Final Office Action at pages 2-3).

Nevertheless, the Final Office Action concludes, *without providing any supporting evidence*, that it would have been obvious to a person of ordinary skill in the art at the time the invention was made to select the gate electrode 5 having a combined gate thickness slightly less than 100 nm and to select the gate insulating file 4 having a thickness of 100 nm to reduce the size of the device (Final Office Action at page 2).

In response, the Final Office Action appears to argue that it would always be obvious for one of ordinary skill in the art to try varying every parameter of a system in order to optimize the effectiveness of the system even if there is no evidence in the record that the prior art recognized that particular parameter affected the result. However, obvious to try is not the standard of 35 USC 103. *In re Antonie*, 195 USPQ 6, 8 (CCPA 1977).

As a rule, "one way for a patent applicant to rebut a *prima facie* case of obviousness is to make a showing of 'unexpected results,' i.e., to show that the claimed invention exhibits some superior property or advantage that a person of ordinary skill in the relevant art would have found surprising or unexpected." *In re Geisler*, 43 USPQ2d 1362, 1365 (Fed. Cir. 1997).

"When an applicant seeks to overcome a prima facie case of obviousness by showing *improved performance* in a range that is within or overlaps with a range disclosed in the prior art, the applicant must 'show that the [claimed] range is critical, generally by showing that the claimed range achieves unexpected results relative to the prior art range.'" *In re Geisler*, 43 USPQ2d 1362, 1365 (Fed. Cir. 1997).

"All evidence of nonobviousness must be considered when assessing patentability." *Richardson-Vicks Inc. v. The Upjohn Co.*, 44 USPQ2d 1181, 1186 (Fed. Cir. 1997).

"Consistent with the rule that *all evidence* of nonobviousness must be considered when assessing patentability, the PTO must consider comparative data in the specification in determining whether the claimed invention provides unexpected results." *In re Soni*, 34 USPQ2d 1684, 1687 (Fed. Cir. 1995). See also, *In re Wright*, 6 USPQ2d 1959, 1962 (Fed. Cir. 1988).

Paragraph [0034] of U.S. Patent Application Publication No. 2001/0011726, the publication document for the present application, provides that:

> [0034] As the characteristic matter of this invention, the gate electrodes are comprised of metallic materials, whose thickness Tm is established with less than 100 nm. As the metallic materials, for instance, metals with high melting point can be adopted, selective from Mo (molybdenum), Ta (tantalum), Cr (chromium) or the like. According to this embodiment, Mo with thickness Tm of, for instance, 90 nm is used. The gate insulating film 4 covering the gate electrodes 5 is comprised of deposited film of, for instance, silicon dioxide (SiO_2), whose thickness Ti is established to be ***greater than*** the thickness Tm of the gate electrodes 5. By making the thickness Tm of the gate electrodes 5 to be less than 100 nm, thermal capacity can be reduced and the difference in thermal condition on the gate electrodes 5 and the insulating substrate 1 is made small, thereby trying to enlarge a process margin occurred by the laser anneal treatment. In this case, *if the thickness Ti of the gate insulating film 4 located between the gate electrodes 5 and the semiconductor thin film 2 is too thin, an effect of reducing the thickness Tm of the gate electrodes 5 is offset*. Therefore, *the thickness Ti of the gate insulating film 4 is made to become* ***greater than*** *the thickness Tm of the gate electrodes 5*. For instance, when the thickness Tm of the gate electrodes 5 is 90 nm, the thickness Ti of the gate insulating film is made to be 110 nm. The semiconductor thin film 2 deposited on the gate

insulating film 4 is comprised of polycrystalline silicon crystallized by an irradiation of a laser beam. Its thickness is, for instance, 40 nm.

"An applicant relying on comparative tests to rebut a prima facie case of obviousness must compare his claimed invention to the closest prior art." *In re De Blauwe*, 222 USPQ 191, 196 (Fed. Cir. 1984).

Here, the Final Office Action cites Hisao as the closest cited prior art.

**** However, the Final Office Action fails to show within Hisao a criticality in the relationship between the thickness of the gate insulating film 4 and the thickness of the gate electrode 5a,5b.*

*Thus, the Final Office Action **fails** to show unexpectedly superior results within Hisao produced by the thickness of the gate insulating film 4 being greater than the thickness of the gate electrode 5a,5b.*

- ***Thus, the Office Action fails to show Hisao as teaching the presence of a thin film semiconductor device wherein a thickness of said gate insulating film is greater than a thickness of said gate electrode.***

Colgan - The Final Office Action cites Colgan for the features that are admittedly deficient from within Hisao.

Colgan arguably the presence of a first metal layer 3, a second metal layer 5, and a third metal layer 7 (Colgan at Figure 7).

Even still, Colgan arguably teaches that the first metal layer preferably has a thickness of 500 angstroms (Colgan at column 3, lines 22-23).

Colgan arguably teaches that the second metal layer 5 may be an *Aluminum (Al) layer* formed by, for example, sputter depositing the Aluminum (Colgan at column 3, lines 26-28). The

second metal layer 5 preferably has a thickness in the range from 1000 angstroms to 4000 angstroms (Colgan at column 3, lines 36-39).

Colgan arguably teaches that the third metal layer 7 may be a *Molybdenum (Mo) layer* formed by, for example, sputter depositing the Molybdenum (Colgan at column 3, lines 43-46). The third metal layer 7 preferably has a thickness of 500 angstroms (Colgan at column 3, lines 52-53).

However, Colgan fails to show the presence of a gate insulating film.

- ***Thus, Colgan fails to disclose, teach, or suggest the presence of a thin film semiconductor device wherein a thickness of said gate insulating film is greater than a thickness of said gate electrode.***

Seiki - The Final Office Action cites Seiki for the features that are admittedly deficient from within Hisao.

Seiki arguably the presence of conductive layers 111, 113, 115 and gate insulating film 121 (Seiki at Figure 3).

- ***However, Seiki fails to disclose, teach, or suggest the presence of a thin film semiconductor device wherein a thickness of said gate insulating film is greater than a thickness of said gate electrode.***

Conclusion

Withdrawal of this rejection and allowance of the claims is respectfully requested.

The claims are considered allowable for the same reasons discussed above, as well as for the additional features they recite.

Reversal of the Examiner's decision is respectfully requested.

Dated: February 26, 2008

Respectfully submitted,

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CLAIMS APPENDIX

1-16. (Canceled)

17. (Previously presented) A thin film semiconductor device comprising:

a gate electrode in contact with an insulating substrate;

a gate insulating film in contact with a gate electrode, said gate electrode being between said insulating substrate and said gate insulating film,

wherein a thickness of said gate insulating film is greater than a thickness of said gate electrode.

18. (Previously presented) The thin film semiconductor device according to claim 17, wherein a semiconductor thin film is in contact with said gate insulating film, said semiconductor thin film including a source region, a channel region, and a drain region.

19. (Previously presented) The thin film semiconductor device according to claim 18, further comprising:

a stopper is in contact with said channel region, said channel region being between said gate insulating film and said stopper.

20. (Previously presented) The thin film semiconductor device according to claim 19, wherein said stopper is an insulator.

21. (Previously presented) The thin film semiconductor device according to claim 19, wherein said source and drain regions are adjacent said channel region.

22. (Previously presented) The thin film semiconductor device according to claim 18, wherein said gate electrode includes a lower layer and an upper layer, said lower layer being between said insulating substrate and said upper layer.

23. (Previously presented) The thin film semiconductor device according to claim 22, wherein said lower layer is in contact with said insulating substrate.

24. (Previously presented) The thin film semiconductor device according to claim 22, wherein said upper layer is in contact with said lower layer.

25. (Previously presented) The thin film semiconductor device according to claim 22, wherein said gate insulating film is between said upper layer and said semiconductor thin film.

26. (Previously presented) The thin film semiconductor device according to claim 22, wherein an electric resistance of said upper layer is greater than said lower layer, heat conductivity of said lower layer being greater than said upper layer.

27. (Previously presented) The thin film semiconductor device according to claim 22, wherein said lower layer is a metallic material and said upper layer is another metallic material.

28. (Previously presented) The thin film semiconductor device according to claim 27, wherein said metallic material contains aluminum.

29. (Previously presented) The thin film semiconductor device according to claim 28, wherein said metallic material is aluminum.

30. (Previously presented) The thin film semiconductor device according to claim 28, wherein said metallic material is an alloy of aluminum and silicon.

31. (Previously presented) The thin film semiconductor device according to claim 27, wherein said another metallic material is from the group consisting of molybdenum, tantalum, tungsten and chromium.

32. (Previously presented) The thin film semiconductor device according to claim 31, wherein said another metallic material is molybdenum.

33. (Previously presented) The thin film semiconductor device according to claim 31, wherein said another metallic material is tantalum.

34. (Previously presented) The thin film semiconductor device according to claim 31, wherein said another metallic material is tungsten.

35. (Previously presented) The thin film semiconductor device according to claim 31, wherein said another metallic material is chromium.

36. (Previously presented) A display device comprising:

a plurality of pixels arranged in a matrix form, one of said plurality of pixels being driven by the thin film semiconductor device according to claim 18.

EVIDENCE APPENDIX

There is no other evidence which will directly affect or have a bearing on the Board's decision in this appeal.

RELATED PROCEEDINGS APPENDIX

The Decision on Appeal dated June 28, 2007 reversed the rejection under 35 U.S.C. §102 of prior claims 1-8, 13, and 15 while sustaining the rejection under 35 U.S.C. §103 of prior claims 14 and 16. Page 8 of the Decision on Appeal indicates a rejection under 37 C.F.R. §41.50(b).

There are no other appeals or interferences which will directly affect or be directly affected by or have a bearing on the Board's decision in this appeal.